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AUTHOR Okey, James R.; Capie, William
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ABSTRACT

Described is a teacher competency assessment system and reports on its reliability and validity. The assessment instrument is composed of competency indicators upon which student-teachers are rated on a 1-5 point scale. It was developed from competency statements solicited from a variety of groups across the country that were working on teacher assessment. The assessment is completed by examining the plans and records of a teacher, observing the teacher during class, interviewing, and with knowledge of professional activities in and out of school. The assessment takes two or three hours. Reliability and validity studies have shown that the instruments have respectible validity and reliability. (BB)

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ASSESSING THE TEACHING COMPETENCE OF SCIENCE TEACHERS

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James R. Okey and William Capie
Department of Science Education
University of Georgia
Athens, Georgia

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ASSESSING THE TEACHING COMPETENCE OF SCIENCE TEACHERS

James R. Okey and William Capie

Competency based teacher training is conducted under the assumption that job related teaching skills can be identified, taught, and used in classrooms. A further assumption is that the teaching skills are valid; to be valid means that the skills are related to desired pupil outcomes. As research results accumalate and experience in operating competency based programs grows, the assumptions described above are translated into more certain knowledge about important teaching skills to be taught and learned and the effects that they have when used.

In order to help teachers acquire competencies in training programs and to conduct research on skill effectiveness, procedures and instruments for assessing teaching competence are needed. The purpose of this paper is to describe a competency assessment system and report on its reliability and validity. Data from a tryout of the assessment system with a group of preservice science teachers will be presented to show the type of information that the assessment provides to teachers, teacher educators, or researchers.

The assessment system was developed by the Teacher Assessment Project at the University of Georgia under contract with the Georgia Department of Education. The state legislature had mandated that teacher certification in Georgia would be decided by the state department and these instruments were to be one source of information used in making certification decisions. Although certification was the impetus for developing the instruments the intent was to develop procedures and instruments that could be used in assessing teaching competence whatever the purpose--certification, teacher training, inservice education, program evaluation, or research on teaching.

Identifying the Teaching Competencies

The competencies to be assessed were identified in another study (Johnson, et al., 1978). Briefly, the process of identifying the competencies for the Georgia project involved collecting and categorizing teacher competency statements obtained from a variety of groups across the country that were working on teacher assessment. The 52 competency statements that resulted from the categorization were submitted to a large group of professionals in the state to be rated on their desirability as skills for teachers to possess. More than 5,000 teachers, administrators, and college professors rated each of the 52 competency statements on a 4-point scale (essential, highly desirable, desirable, or none of these).

The results from the statewide survey were used by the State Department of Education to select 33 competencies for inclusion in the assessment instruments. Because of some overlap in the 33 competency statements they were finally reduced to 20 statements. The final list of 20 competencies and the teaching functions with which they are associated are given in Figure 1.

Insert Figure 1 About Here

The encouraging result of the survey study was the high agreement on ratings among subgroups and with the entire group of raters. For example, the science teachers in the sample (n = 168) ranked the same 10 competency statements highest as did the entire sample of 5,235 respondents. There were, of course, differences as to whether a competency was first or third or whatever, but the same cluster of competency statements was rated as most essential for teachers by both groups.

Developing the Instruments

The competency statements shown in Figure 1 are quite general and require further specification before they can be observed and rated. To accomplish

this, indicators of each competency were developed. A competency statement can be considered a general goal or objective and describes a broad class of behavior. An indicator is a more specific statement that describes one piece of evidence to show that the competency is being demonstrated. Several indicators can be used to define the behaviors that collectively define what demonstration of the competency entails. Figure 2 shows two competencies from the list and the indicators that were used to define them. The number of indicator statements for the 20 competencies ranged from 2 to 5 for a total of 69 indicators. The most recent version of the instruments developed after the data in this report was obtained contains 18 competencies and 55 indicators.

Insert Figure 2 About Here

Although indicators are more specific than the competencies they define the level of inference required to rate them is still high. If, for example, observers in a classroom are to use a 5-point scale to rate how well or to what degree the indicator behavior was exhibited they will usually disagree unless the 5 scale points are clearly defined. To achieve this definition, each point on a five-point scale was defined in observable terms for each of the indicators. The "1" point on the scale is a description of poor or missing behavior. The "3" point is a description of acceptable behavior and the "5" point is a description of superlative performance on the indicators. In some cases instead of developing a 1 to 5 scale that describes varying levels of ability it was necessary to list a variety of practices that a teacher might follow. In these cases the teacher was rated on the number of practices that they used appropriately. An example of an indicator and the 5-point scale used to rate it is given in Figure 3.

Insert Figure 3 About Here

Using the Assessment Instruments

Procedures have been established for using the instruments to assess student teachers and regularly employed teachers. Of course these are not the only way the instruments can be used but will illustrate what is involved in an assessment of the competencies. A Manual for Data Collectors (Okey, Capie, & Johnson, 1978) is available that includes a listing of the competencies, the indicators for each competency, and the descriptors for the indicator scales. Because the competencies are directed toward different kinds of teaching skills, they are assessed with 4 instruments. Figure 4 provides descriptive information on the instruments.

Insert Figure 4 About Here

An assessment is completed by examining the plans and records of a teacher, observing the teacher during class, interviewing the teacher, and with knowledge of professional activities in and out of school. The persons completing an assessment either are or have been teachers. Two to three hours are required to complete all the assessment activities.

Student teachers are assessed by the regular classroom teacher with whom they are working and by their college or university supervisor. Regularly employed teachers are assessed by an administrator from the school, a colleague from the same teaching area, and by a data collector from outside the school. An attempt has been made to have all persons completing assessments complete a training program on using the assessment instruments (Capie, Okey, and Johnson, 1978).

Validity and Reliability Data

Nearly 1500 teachers and student teachers were assessed during the 1977-78 school year as a part of a statewide pilot study to establish the validity and

reliability of the instruments. Assessments of a larger group are underway during the 1978-79 school year.

Reliability of the instruments is determined by having multiple observers simultaneously assess the same plans or observe the same lesson (live or via videotape). Internal consistency estimates obtained under these conditions have ranged from .6 upward. Interpersonal Skills are the most difficult to assess reliably and Classroom Procedures are the easiest. Classroom observation studies show that several observers of the same teacher agreed on ratings more than half the time and gave the same or adjacent ratings (e.g., 4 and 5 or 2 and 3) more than 95% of the time.

Factor analysis has been used to determine if indicators fit the competency to which they have been assigned and to see if all indicators contribute to a competency score. Results from the 1977-78 tryout indicated that the logical clustering of competencies according to function and classification of indicators by competencies was supported to a considerable degree by the factor analysis. Discrepancies in the data were used as one basis for revision of the instruments. For example, factor analysis showed that the indicators on the Professional Standards instrument were loading on two factors instead of three as hypothesized. So the revision of that instrument included merging two of the competency statements.

Validity studies of the instrument have examined the question of whether high levels of use of the teaching competency by teachers corresponds to high levels of pupil achievement. The findings have been that use of the competencies correlates moderately (.29 to .50) with pupil achievement on teacher made tests and weakly with achievement on standardized tests (Okey, Capie, Ellett, & Johnson, 1979).

Reviews of teacher competency studies by Rosenshine (1977) show that one of the strongest correlates of pupil achievement is the on-task behavior of students--the time they actually spend studying. Our findings show that 16 of the 20 competencies scores correlate significantly ($p<.05$) with on-task behavior (ranging from .38 to .70). On-task behavior, in turn, correlated significantly with pupil achievement ($r = .42$, $p = .02$).

Collectively, the studies briefly described above and others conducted by the project staff have shown that the Georgia assessment instruments have respectable validity and reliability. Trained observers using the instruments can agree on the level of teaching competence shown by teachers and use of the competencies by teachers relates to both the study skills of students and their achievement.

Sample Assessment Data

Competency scores for teachers are determined by computing the mean score for all indicators of a competency. When several observers complete an assessment of a teacher their individual scores are averaged to produce mean indicator scores and then mean competency scores.

Figure 5 presents competency data from 18 student teachers in science. Each student teacher planned and taught a 5-10 day unit near the end of a 10-week student teaching assignment. The master teachers with whom they were working and the university supervisors completed an assessment during this time. Individual scores by the two observers were then combined to produce the competency scores shown in the figure.

To illustrate the range of competency scores for student teachers, Figure 5 shows the mean competency score for the 18 teachers and then individual competency scores for two individuals in the group--one had the highest set of scores and the other the lowest. It is worth noting that students with the overall weakest scores still has strengths (two clusters of scores are at

or near 4 on the 5-point scale). Thus a profile helps a teacher or a supervisor obtain detailed feedback on both strong and weak points.

Insert Figure 5 About Here

Using the Competency Assessment Instruments

Data from a competency assessment can serve a number of purposes. Among these are:

a. information to the person being assessed.

Although Figure 5 shows scores for the competencies, the teacher or student teacher receives scores on each indicator as well. Teachers can then see a detailed analysis of their strong points and weak points.

b. information to supervising teachers.

The competency and indicator scores provide information for supervisors to use in feedback to teachers and as a basis for providing assistance with teaching skills that are not present at desired levels.

c. information for program evaluators.

If competency data are summarized across all teachers participating in training, inferences can be made about the training program itself. Training procedures, experiences, and materials associated with competencies not demonstrated adequately are candidates for alteration.

d. data for research on teaching skills.

If relationships (correlational or causal) between teaching competencies and pupil outcomes are to be found, then procedures for assessing the competencies are needed. These assessment instruments provide a reliable means of assessing teaching competencies which may be the dependent variables in competency acquisition studies or the independent variables in competency effectiveness studies.

FUNCTIONS	COMPETENCIES
Planning Instruction	- Plans instruction compatible with capabilities and needs of learners
	- Organizes instruction to take into account individual differences among learners
Instructing	- Uses techniques, methods and media related to the objectives
	- Communicates with learners
	- Reinforces and encourages learners
	- Demonstrates a repertoire of methods and techniques
	- Involves learners in the learning tasks
	- Demonstrates understanding of subject matter
Managing Instruction	- Organizes time, space, and materials for instruction
	- Adjusts instruction to individuals and conditions
Providing the Learning Environment	- Demonstrates enthusiasm for teaching and the subject
	- Helps learners develop positive self concepts
	- Manages interactions to discourage disruptions
	- Manages disruptive behavior
Evaluating Learners	- Obtains information about the needs and progress of learners
	- Refers learners with problems to specialists
	- Collects data on instruction and revises when needed
Being a Professional	- Works cooperatively with colleagues
	- Engages in self-evaluation and self-improvement
	- Completes obligations of contract

Figure 1. Teaching competencies categorized by teaching function.

COMPETENCY	INDICATORS
DEMONSTRATES A REPERTOIRE OF TEACHING METHODS	Demonstrates ability to conduct lessons using a variety of teaching methods.
	Uses teaching methods appropriate for objectives and learners.
	Demonstrates ability to work with individuals, small groups, and large groups.
PLANS INSTRUCTION TO ACHIEVE SELECTED GOALS	Specifies or selects learner objectives for lessons.
	Specifies or selects teaching procedures for lessons.
	Specifies or selects content, materials, and media for lessons.
	Specifies or selects materials and plans for assessing learners.
	Plans instruction at a variety of cognitive levels.

Figure 2. Examples of teaching competencies and associated indicators.

Specifies or selects materials and plans for assessing learners.

1. No plans and materials for assessing learners are included in the instructional unit.

2. Tests to assess learners are included in the instructional unit. Many of the items, however, seem inappropriate to the objectives of the unit or the learners.

3. Tests appropriate to the objectives and the learners are included in the unit.

4. In addition to the items in #3, procedures such as interviews, questionnaires, or self tests are prepared and ready to use with learners.

5. In addition to the information in #4, plans and materials are available for assessing attitudes of learners toward the topic and the instruction.

(The task of an assessor is to select the descriptor statement (1-5) which best characterizes the teacher performance.)

Figure 3. An example indicator with descriptors.

Instrument	# of competencies assessed	How assessed
Teaching Plans and Materials	5	Examine teaching plans and records and interview with teacher
Classroom Procedures	8	Classroom observation of teaching
Interpersonal Skills	4	Classroom observation of teaching
Professional Standards	3	Based on observations of activities in and out of school

Figure 4. Instruments used in assessing teaching competence.

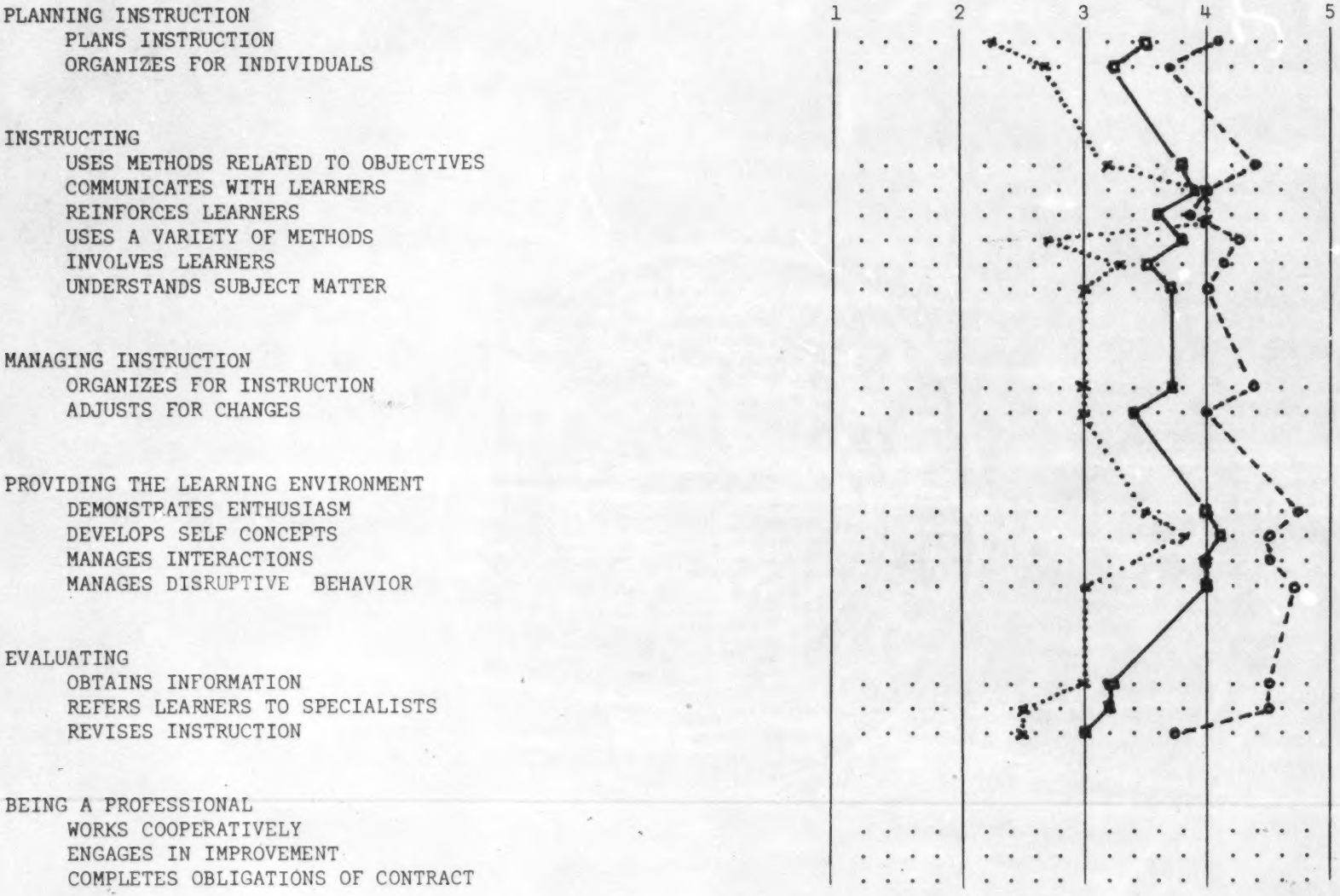

Figure 5. Mean competency scores for 18 student teachers (science) with individual scores for the lowest and highest performing teacher. (Note that student teachers are not assessed on all 20 competencies.)

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